

obstructive pulmonary disease (COPD), diabetes mellitus, coronary artery disease (CAD), lack of statins on treatment (1 point each). We calculated the total risk score as the sum of all risk factors' points, and grouped them into 4 categories. Another 334 asymptomatic patients were extracted from two tertiary care medical centers to derive a validation cohort (VC). The derivation cohort (DC) and VC were clinically similar in terms of age (74 vs. 72 years) and gender (males 66% vs. 63%). Among risk factors, they differed only for CAD (20% vs. 30% $P < 0.001$) and statin therapy (44% vs. 60% $P < 0.001$). They were comparable as per diabetes (29% vs. 24% $P = 0.09$), mean creatinine (1.13 vs. 1.1 mg/dL, $P = 0.58$) and COPD (13.2% vs. 10.5%, 0.21).

Results: Median follow up was 56 months for DC and 65 months for VC. Long term mortality was comparable among DC and VC: overall survival was $98.9 \pm 0.4\%$ vs. $96.7 \pm 0.1\%$ at 1 year; $92.7 \pm 1.1\%$ vs. $91 \pm 1.6\%$ at 3 years and $84.7 \pm 1.7\%$ vs. $85.2 \pm 2\%$ at 5 years. When comparing groups, 5 years survival rate was $97 \pm 1.5\%$ for patients with score 0–3, $88.4 \pm 2.2\%$ for score 4–7, $69.6 \pm 4.7\%$ for score 8–11, and $48.1 \pm 13.5\%$ for score ≥ 12 ($P < 0.0001$) in the DC (fig. 1). Similarly in the VC we found a $95.5 \pm 2\%$ 5 years survival for score 0–3, $89.5 \pm 2.7\%$ for score 4–7, $65 \pm 6.1\%$ for score 8–11 and $44.8 \pm 14.1\%$ for score ≥ 12 ($P < 0.0001$).

Conclusion: Our scoring system is a simple, 6 variables clinical tool for prediction of post-operative life expectancy. The score showed to predict adequately the long-term survival in a validation cohort from two different medical centers. Patients with a score >8 have a poor long term survival, and the advantage of CEA in this subgroup is questionable. We believe that our score may help clinicians while selecting asymptomatic patients who would benefit from CEA.

Stroke/Death Rates Following Carotid Artery Stenting and Carotid Endarterectomy in Contemporary Administrative Dataset Registries: A Systematic Review.

K.I. Paraskevas, E.L. Kalmykov, A.R. Naylor

Leicester Royal Infirmary, Leicester, United Kingdom

Introduction: Randomized trials have reported contradictory findings regarding outcomes after carotid artery stenting (CAS) versus carotid endarterectomy (CEA). Despite this, the 2011 American Heart Association (AHA) guidelines expanded CAS indications, partly because of data from the Carotid Revascularization Endarterectomy versus Stenting Trial (CREST), but also because of improving outcomes in Industry-sponsored 'high risk for CEA' CAS Registries. The aim of the current systematic review was to see whether there was a parallel reduction in procedural risk after CAS in contemporary administrative dataset registries.

Methods: PubMed/Medline, Embase and Cochrane databases were systematically searched from January 1, 2008 until February 23, 2015 for administrative dataset registries reporting outcomes after both CEA and CAS.

Results: Twenty-one registries reported outcomes after $>1,500,000$ procedures. CAS had similar stroke/death rates with CEA in one registry involving 'average risk' asymptomatic and in two registries involving 'average risk' symptomatic patients. Stroke/death rates after CAS were significantly higher than CEA in 9/15 registries involving 'average risk' asymptomatic and in 11/18 registries involving 'average risk' symptomatic patients. In five registries, CAS was associated with higher stroke/death rates than CEA for both symptomatic and asymptomatic patients, but formal statistical comparison was not reported. CAS was associated with stroke/death rates that exceeded risk thresholds recommended by the AHA in 9/15 registries involving 'average risk' asymptomatic patients and in 13/18 registries involving 'average risk' symptomatic patients. In 5/18 registries, the procedural risk after CAS in 'average risk' symptomatic patients exceeded 10%.

Conclusion: Data from contemporary administrative dataset registries suggest that stroke/death rates following CAS remain significantly higher than after CEA and frequently exceed accepted AHA thresholds. In this systematic review, there was no evidence of a sustained decline in procedural risk after CAS. The extremely high published risks in some symptomatic registries suggest that clinical governance is not being applied.

Genetic Polymorphisms Influence in the Response to Clopidogrel in Peripheral Artery Disease Patients Following Percutaneous Transluminal Angioplasty

F. Fernández-Quesada¹, X. Díaz-Villamarín², C.L. Dávila-Fajardo², J. Sánchez-Ramos³

¹ Department of Vascular Surgery, Hospital Universitario San Cecilio, Granada, Spain

² Department of Clinical Pharmacy, Hospital Universitario San Cecilio, Granada, Spain

³ Department of Cardiology, Hospital Universitario San Cecilio, Granada, Spain

Introduction: Clopidogrel has provided significant reduction in major vascular events in patients with peripheral artery disease (PAD), particularly among those following PTA. Clopidogrel antiplatelet effects differ according to genotype ABCB1 and CYP2C19, establishing normal, intermediate and poor metabolizers; and good or bad carriers. Intermediate and poor metabolizers (CYP2C19 *1/*2,*2/*2) and bad transporters (ABCB1TT) are responsible for the poor antiplatelet drug response. These polymorphisms have been associated with differences in clopidogrel response in acute coronary syndrome patients but effects in peripheral artery disease are still understudied.

To determine the onset of ischemic vascular events requiring reoperation of the affected limb or amputation in patients undergoing PTA (+/- stent) during one year after treatment and to study the association with the presence of genetic polymorphisms CYP2C19 and ABCB1 (separately and combined) a case-control study was performed.

Methods: 72 patients with PAD of the lower limbs under PTA (+/- stent) and treated with clopidogrel were selected. CYP2C19*2 (rs4244285), CYP2C19*3 (rs4986893) and ABCB1 (rs1045642) polymorphisms were genotyped using Taqman allelic discrimination technique to compare post-operative results.

Results: Out of the 72 patients included in the study, 18 were CYP2C19*2 allele carriers, no patient carried CYP2C19*3 allele and 14 patients were ABCB1TT genotype. Out of the 72 patients, 25 (34.7%) had an event during follow up (1 year). Patients with at least some loss of function had a higher rate of events compared to patients with no loss of function allele (OR = 5.0, 95% CI 1.75–14.27, $p = 0.003$), and patients with some loss of function allele were associated with a worse Fontaine evolution (OR = 13.96, 95% CI 4.44–43.82, $p < 0.0001$). Reduced and non metabolizer patients also had a higher rate of events compared to good metabolizer patients (OR = 4.49, 95% CI 1.25–13.84, $p = 0.009$) and a worse outcome Fontaine grade (OR = 8.31, 95% CI 2.36–29.16; $p = 0.001$). However, poor transporter patients didn't show a statistically significant higher rate of events comparing to good transporters although they showed a worse Fontaine grade evolution (OR = 4.75, 95% CI 1.32–17.07, $p = 0.017$).

Conclusion: Poor metabolizer patients of clopidogrel have a higher risk of major ischemic events and worst Fontaine grade evolution. Our results support the role of CYP2C19 and ABCB1 polymorphisms as genetic markers for vascular events in patients with peripheral vascular disease of the lower limbs undergoing PTA and treated with clopidogrel.

Polymeric Microspheres as Novel Delivery Platform for Pro-angiogenic Therapy

Z. Aref, H.A.B. Peters, M.R. de Vries, J. Zupancich, A.Y. Nossent, P.H.A. Quax

Leiden University Medical Center, Leiden, The Netherlands

Introduction: Angiogenesis, the sprouting of new capillaries from the microvasculature, improves blood perfusion of ischemic tissue. Various pro-angiogenic factors have the potential to stimulate and enhance angiogenesis. However, due to poor drug delivery and rapid clearance, clinical trials on pro-angiogenic therapeutics in peripheral arterial disease have only been marginally successful. We aimed to develop a polymer-based drug delivery platform enabling local, sustained delivery of pro-angiogenic

factors, using vascular endothelial growth factor A165 (VEGF) as a model component.

Methods: Polymeric PEA microspheres were prepared and loaded with VEGF. The release of VEGF from these microspheres, in both cell culture medium and human serum at 37°C was followed over time. VEGF concentrations were analyzed by ELISA; biological activity of the released VEGF was assessed using proliferation assays on human umbilical vein endothelial cells (HUVECs). VEGF-loaded microspheres were investigated for their pro-angiogenic potential in vivo, either in matrigel plugs or by intramuscular injection after induction of hindlimb ischemia in mice. Neovascularization was monitored by immunohistochemistry and Laser Doppler Perfusion Imaging.

Results: Our experiments showed that VEGF remains stable and biologically active during both fabrication and long-term storage of the microspheres. After re-suspension in either cell culture medium or human serum, VEGF is released from the microspheres. An initial burst release over 48 hours is followed by a gradual, sustained release over 2 weeks. The released VEGF was able to induce proliferation of HUVECs with virtually no loss of biological activity. In vivo, microspheres containing approximately 15 ng VEGF were able to induce angiogenesis similar to 250 ng of unprotected VEGF in a matrigel plug assay in mice. After induction of hindlimb ischemia, both VEGF and VEGF-loaded microspheres show a comparable increase in blood flow recovery. Immunohistochemical analyses however show a stronger increase in the number of collateral arteries in the adductor muscles of mice treated with VEGF loaded microspheres compared to free VEGF.

Conclusion: VEGF can be loaded into polymeric PEA microspheres and stored without loss of biological activity. Under physiological conditions, a burst of VEGF is released over 48 hours, followed by sustained release of VEGF over 2 weeks. VEGF-loaded microspheres showed an over tenfold increase in angiogenic potential compared to free VEGF in vivo in matrigel plugs. Furthermore the increase in number of collateral arteries in the adductor muscles of mice subjected to hindlimb ischemia suggests a beneficial effect of sustained release of VEGF.

RCT Comparing the Long-term Results of UGFS, EVLA and Open Surgery in the Treatment of GSV Reflux

S. Vähäaho, A. Albäck, K. Halmesmäki, O. Mahmoud, E. Saarinen, M. Venermo

Vascular Surgery, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

Introduction: As options for open surgery in the treatment of great saphenous vein (GSV) reflux, both UGFS (ultrasound guided foam sclerotherapy) and EVLA (endovenous laser) have been used for years, but the long-term results compared to open surgery are still unclear. In the current study we analyzed the 5 year results of a RCT comparing UGFS, EVLA and Surgery in the treatment of GSV reflux and varicose veins.

Methods: We randomized 233 patients from 2 hospitals who had symptomatic GSV reflux in one leg for UGFS, EVLA or open surgery (ligating and stripping the GSV). In total 196 patients from our hospital were included and treated during 2008–2010. In EVLA and Surgery groups local phlebectomies were done simultaneously when necessary. 5 years after the treatment we invited all patients treated in our hospital to clinical control. Prevalence of varicose veins, DD-ultrasound and patient satisfaction were evaluated. Furthermore, information on the additional treatments for the same leg during the follow up was recorded. 166 patients (UGFS n = 68, EVLA n = 67, Surgery n = 61) participated in the 5 year control (85% of the patients originally treated in our hospital).

Results: After 5 years from UGFS, EVLA and Surgery, there was no reflux in GSV DD in 50.8%, 89.5% and 95.9% respectively (UGFS vs. EVLA/Surgery $p < 0.01$). The CEAP classification was not significantly associated with the type of treatment, and neither was cosmetic satisfaction, experienced pain caused by the varicosities, disability or the presence of oedema. However, during the 5 year period 15.3% of the patients in the UGFS group had gotten additional treatment (most often laser ablation of GSV and local phlebectomies) compared to EVLA and Surgery groups (3.3% and 4.0% respectively, $p < 0.05$ compared to UGFS-group). Furthermore, at 5 year

follow, 22.0% of the patients in the UGFS group were assigned for additional treatment compared to 6.8% in EVLA group and 8.0% in Surgery group ($p < 0.05$). The odds of needing a new treatment were 5.9 times higher if treated with UGFS compared to EVLA, EVLA having the lowest ratio of new treatment.

Conclusion: Even though there was no difference in subjective patient satisfaction, UGFS resulted in more additional treatments and was associated with significantly more fully or partially refluxing GSV's after the treatment. Therefore, we conclude that UGFS is not as feasible as EVLA or open surgery.

Pilot Randomised Control Trial: Neuromuscular Electrical Stimulation in Treating Venous Disease

R. Ravikumar, K.J. Williams, A. Babber, T.R. Lane, H.M. Moore, A.H. Davies

Imperial College London, United Kingdom

Introduction: Chronic venous disease (CVD) is a common and potentially costly condition affecting a significant proportion of the population. This pilot randomised control trial investigates the effect of a neuromuscular electrical stimulation (NMES) device that causes sequential contraction of the foot and calf muscles in patients with CVD.

Methods: Twenty-two patients with CEAP C2-C4 venous disease were randomised to a sham or test device. Patients were asked to use the device for 30 minutes per day for 6 weeks. Haemodynamic measurements (duplex ultrasound and laser doppler fluximetry), limb volume (perometer), venous refill time (digital photoplethysmography) and quality of life outcome measures were measured at baseline and after 6 weeks.

Results: The mean age of participants was 62 years, BMI 28.6, with a 15:7 female preponderance. At week 0, there was a significant improvement in femoral vein haemodynamics (from baseline) whilst using the device in the test compared to sham group (time averaged mean velocity (TAMV) 102.4% versus -9.1%, $p < 0.0001$; volume flow 107.9% versus -3.7%, $p < 0.0001$; peak velocity 377.7% versus -6.7%, $p < 0.0001$). The sham group demonstrated an increase in limb volume, which was prevented with the use of the device in the test group (sham +2.0%, $p < 0.0001$; test +0.8%; $p = 0.0623$). There was no improvement in limb volume in either the sham or test group over the 6 weeks (sham +0.7%, $p = 0.16$; test +2.3%, $p = 0.74$). A non-statistically significant improvement in disease specific quality of life outcome measures (AVVQ) was observed in the test group over the 6 weeks.

Conclusion: This trial demonstrated a significant improvement in venous haemodynamics and reduction in limb swelling with the test device compared to the sham group following immediate usage. In addition, it had a positive effect on quality of life outcome measures. The device is safe to use as a home based adjunct in managing venous disease. Due to the small sample size, some improvements were not statistically significant and subgroup analysis was not performed. Further trials are required to determine optimal frequency of device usage and the effect on different subgroups of patients with venous disease.

Impact of Angiosome Targeted Femorodistal Bypass Surgery on Healing Rate and Outcome in Critical Limb Ischemia.

C. Harth, C. Randon, F. Vermassen

Ghent University Hospital, Ghent, Belgium

Introduction: 3–10% of the worldwide population is suffering from peripheral arterial disease and 1–3% will ultimately develop critical limb ischemia (CLI). In the presence of long lesions, a femorodistal bypass often is the only option to avoid major amputation and secure a better quality of life. The angiosome concept divides the foot into six anatomic regions (angiosomes) fed by distinct source arteries arising from the posterior tibial, anterior tibial and peroneal arteries. This study investigates whether bypass to the artery directly feeding the ischemic angiosome has an impact on wound healing, major amputation rate and mortality before healing was obtained.